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Consumer and Functional Properties of Amur Grape *Vitis amurensis* Rupr. as a Raw Material for Food Enrichment

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The Amur grape (*Vitis amurensis Rupr*.) is a wild grape species rich in bioactive compounds, including polyphenols, resveratrol, and iron, making it a potential functional ingredient for food fortification. Despite its proven antioxidant and nutritional benefits, its application in meat product fortification remains unexplored. The present study aims to evaluate the potential use of the Amur grape to fortify mass consumption food products. A systematic review of relevant literature was conducted using the PRISMA algorithm, analyzing sources from Scopus, Web of Science, and Science Direct. Findings indicate that Amur grape extracts exhibit significant antioxidant activity (367.24±0.53 mg ascorbic acid equivalents/g), which can extend the shelf life of meat products and enhance their nutritional profile. Hence, they exhibit anti-anemic and antioxidant effects when added to food products. The polyphenols of Amur grapes, primarily resveratrol, enhance the antioxidant effect of ascorbic acid and exhibit anticarcinogenic, cardioprotective, anti-stressor, and other effects. The fortification of food products with compositions from Amur grape also improves their organoleptic characteristics and extends shelf life due to high antioxidant activity. The conclusion indicates that there are relatively few developments in food product technologies with Amur grapes, and mass consumption food products, including meat products, fortified with Amur grapes are practically nonexistent on the market. The findings contribute to the development of natural, clean-label antioxidant solutions, aligning with consumer trends toward healthier, functional foods.

Keywords: Amur grape, *Vitis amurensis*, functional food ingredient, resveratrol, meat products, antioxidant properties, natural food additives, food preservation.

INTRODUCTION

The production of functional and fortified food products is a key direction in technology and biotechnology in the food industry. An important vector in technologies for functional and fortified food production is the use of non-traditional plant raw materials, including wildlings, often growing in hard-to-reach areas of the Far Eastern taiga in Russia (Idamokoro and Niba, 2024; Demolin-Leite, 2024). The biologically active substances contained in them that have been identified and studied to date can be successfully used as functional food ingredients in food fortification. The Far Eastern taiga is abundant in the nomenclature of such plants and their resources. However, even in the 21st century, not all the riches of the Far Eastern taiga that contribute to the prevention of diseases are in demand (Abdullaev *et al.*, 2024). This applies to the resources of the Amur grape – *Vitis amurensis* Rupr. Vitis is a genus comprising around 60 species of vining plants in the flowering plant family (Vitaceae). These plants are the most common in tropical and subtropical regions and 25 of these species are endemic to China. The Amur grape is one of the East Asian cultivated grape species (Negrul, 1952). It has come to our days from the Tertiary period of the Cenozoic Era and is a relic of the Far Eastern taiga forests (Shagapov *et al.*, 2012). Amur grapes are subdivided into three ecotypes: northern (growing at the latitude of Khabarovsk), southern (growing at the latitude of Vladivostok), and Chinese (widespread in south China, in the basins of the Huanghe and Sungari rivers, with Heilongjiang, Jilin, and Liaoning provinces having the richest reserves of this wild resource). The Amur grape is also found in Korea and Japan. In Russia, its habitat is concentrated in the Primorsky and Khabarovsk Krais and the southeastern districts of the Amur Region, along the coast of the Sea of

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Okhotsk (along the eastern slopes of the Sikhote-Alin mountain range), reaching the confluence of the Muli and Tumnin Rivers (50°N), down the Amur River to the cliffs of Sofiysk (51°30'), and westward to the Svobodnensky District. The Amur grape along river and stream valleys, along hills, on lower belts of southern slopes, on plateaus, in clearings, on forest edges, and in old felling and burned areas, mainly in cedar-broadleaved and other mixed forests and among shrub thickets, climbing up trees or trailing through bushes and grasses. In open areas, it forms continuous thickets. In the south of its range, it is found up to 60-800 m above sea level; in northern regions, it is found much lower. The plant is a large liana up to 15-20 meters in length and up to 5-8, and in the south – 10-15 and more centimeters in diameter, climbing into the crowns of tall trees. The bark is dark brown to almost black, peeling in strips. Young shoots are green, later turning reddish-brown. The tendrils with which the liana attaches itself to supports are forked and bifurcated, situated on the shoots opposite the leaves. The leaves vary in size and shape: from 7 to 25-30 cm across, from wide ovate and heart-shaped to almost rounded, from almost whole to deeply three- to five-lobed or even deeply incised, with notches of various shapes, coarsely or finely toothed, less often – almost entire, wrinkled and scabrous, thick, glabrous or sparsely scabrous at the top and lighter-colored, with short bristles at the bottom. The flowers are greenish-white, small, staminate with erect stamens and underdeveloped ovary, pistillate – with short, bent downward stamens with sterile pollen. The inflorescence is an elongated raceme. The plant is usually dioecious. The fruit of the Amur grape is a juicy black, with a bluish coat, ball-shaped berry of 8-12 mm in diameter, with a thick skin, sweet and sour, with 1-4 seeds. The clusters are cylindrical or conical, loose or dense, weighing 35-40 g on average. The seeds are about 5 mm long, with a short tip splitting at the end. The Amur grape flowers in June, and the fruit ripens in September. The plant is light-loving and undemanding to soil but develops better on fertile, loose, and well-warmed soils. A distinctive feature of the Amur grape is its resistance to winter temperatures in the Far East; the plant tolerates frosts as low as -42...-45°C, although the yield decreases after a cold winter. In this regard, of interest is the research of Qin *et al.* (2023), where Amur grape genes (VaCP17) were used to obtain genetically modified European technical grape varieties resistant to frosts. All forms of Amur grapes have a short vegetation period while being significantly more resistant to fungal and viral diseases compared to European grape varieties. The average yield of Amur grapes reported by Minkhaidarov and Rozlomii (2021) is 6.3 kg per hectare with a recovery period of 2 years. This suggests that the total annual resource of the Amur grape in Russia is no less than 100 thousand tons annually with the total resource of all technical grape varieties reaching about 750 thousand tons. The yield of Amur grapes ranges from 1.5 to 6-10 or more kilograms per vine. Overviews of the applications of the Amur grape, including as a source of biologically active substances, were conducted by Chen *et al.* (2018) and Souid *et al.* (2022). However, there is little fresh information on the chemical composition, properties, and uses of Amur grapes. For the last two decades, this valuable wildling has been practically ignored. In the meantime, its main use as a food product is limited to the production of beverages, primarily alcoholic, and vinegar and its traditional application in the confectionery and bakery industry in dried form. The high antioxidant activity of Amur grape polyphenols (367.24±0.53 mg ascorbic acid equivalents/g) contributes to extended shelf life in fortified food products, particularly in fat-containing products such as meat (Chen *et al.*, 2018). Studies have reported a 20–50% increase in the shelf life of fortified meat products, attributed to the synergistic effect of ascorbic acid and polyphenols in reducing lipid oxidation (Atrooz *et al.*, 2024). Additionally, Amur grape compositions enhance the color stability and sensory profile of processed foods due to their anthocyanin content (Tkeshelashvili and Bobozhonova, 2024).

Despite its numerous advantages, this species has not yet been widely recognized as a source of functional food. The study aimed to evaluate the applicability of Amur grapes in the fortification of mass consumption food products, primarily meat products.

MATERIALS AND METHODS

The article presents an overview of literary sources from the international citation databases such as Scopus, Web of Science, and ScienceDirect and patent information from the World Intellectual Property Organization (WIPO), the Federal Institute of Industrial Property of the Russian Federation, and other peer-reviewed periodicals and Internet sources. The source base for the study was formed using the PRISMA algorithm. We mainly selected articles on the topic published over the last 10 years to ensure the inclusion of the most recent and relevant research findings, reflecting current advancements and trends in the field. At the first stage, scientific materials were searched using keywords in article titles: Amur grape, *Vitis amurensis*, functional food ingredient, resveratrol, meat products, antioxidant properties, natural food additives, food preservation. This search yielded about 80 scientific papers on the topic. At the second stage, the abstracts of the selected texts were analyzed, leaving us with 70 texts. Additionally, preference was given to studies conducted by researchers who had published at least 10 works in the last five years to ensure the inclusion of high-quality and recent contributions. At the third stage, we analyzed the full texts of the articles, ultimately choosing a total of 52 texts. At this stage, more relevant studies that closely aligned with the research objectives were prioritized. The advantages of using PRISMA algorithms are discussed in many research

papers in botanical field (Ndimbo and Haulle, 2024; Türk *et al.,* 2025).

The review article employs Excel tables as a tool for the compilation and organization of data, allowing for a structured and systematic presentation of findings. Utilizing Excel tables allows facilitating comparisons and enhancing the overall analytical process.

RESULTS

Functional food products have to possess scientifically proven properties that reduce the risk of nutrition-related diseases, prevent nutrient deficiencies in the human body, and preserve and improve human health as a result of them containing functional food ingredients (Kozhanov *et al.,* 2023). The Amur grape's high polyphenol content, resveratrol concentration, and iron levels make it a promising candidate for fortification, particularly in iron-rich food matrices like meat products. So, let us examine the chemical composition of Amur grapes, which is summarized in Table 1.

The fruits of the Amur grape contain significant levels of iron (2.1–3.4 mg per 100 g), ascorbic acid (23.5 mg per 100 g), and polyphenols (450–670 mg per 100 g) (Wang *et al.*, 2000; Frolova and Reznichenko, 2019a). These compounds contribute to the anti-anemic and antioxidant properties of the fruit. Iron is essential for hemoglobin synthesis, while ascorbic acid enhances iron absorption and functions as a nonenzymatic antioxidant (Praskova *et al.*, 2021; Lima *et al.*, 2024). Ascorbic acid belongs to nonenzymatic antioxidants. This vitamin activates the biosynthesis of corticoid hormones responsible for adaptive reactions, has an anti-stressor effect (Oohayyid and Musihb, 2024), inhibits lipid peroxidation processes in cell membranes, has a capillary strengthening effect, and participates in redox reactions and the functioning of the immune system. (Anjum *et al.,* 2023). However, the thermolability of ascorbic acid as a functional food ingredient limits its applications in heat-treated foods. Chlorogenic acid contained in Amur grapes may have a positive effect on wound healing (Al-Ghanayem *et al.*, 2024)

DISCUSSION

In recent years, there has been an increased interest in a class of compounds called stilbenes, especially resveratrol, owing to their effects on human health. Stilbenes are a class of polyphenolic compounds that act as phytoalexins in plants, protecting berries from biotic and abiotic stresses (Abo-Nouh *et al.*, 2024; Shafiq *et al.*, 2024). The bulk of stilbenes is found in grape skins. Resveratrol is known to inhibit the Wnt signaling pathway, which regulates the development of malignant tumors, and can therefore be recommended for preventing gastrointestinal, skin, and breast cancers. Resveratrol inhibits metastasis (Aljudaibi *et al.,* 2023; Bejenaru *et al.,* 2024). Furthermore, an apparent inverse correlation has been found between the consumption of resveratrol as part of red wine and the incidence of chronic cardiovascular diseases. Gezer *et al.* (2024) demonstrated the hepatoprotective action of resveratrol and Cherniak and Titova (2014) established its anti-stress effect. A systemic analysis by Zhao *et al.* (2024) showed that resveratrol suppresses joint inflammation and improves cartilage structure in osteoarthritis. Of note is also the effect of reducing toxicity in lead poisoning found by Abdulazeez *et al.* (2024). Furthermore, studies by Jetha *et al.* (2024)

Table 1. Average chemical composition of the fruit of the Amur grape.

Ingredient	Content	Daily requirement, mg (MR 2.3.1.0253-21, 2021)	Ingredient	Content	Daily requirement, mg (MR 2.3.1.0253-21, 2021)	Ingredient
Macro components			Macro components			Macro components
Extractive substances, %	29.3±5.4	-	Extractive substances, %	29.3±5.4	-	Extractive substances, %
Moisture, %	78.6±4.5	-	Moisture, %	78.6±4.5	-	Moisture, %
Sugars, %	11.97±2.2	-	Sugars, %	11.97±2.2	-	Sugars, %
Titratable acids (converted to malic acid), %	2.16±0.40	-	Titratable acids (converted to malic acid), %	2.16±0.40	-	Titratable acids (converted to malic acid), %
Protein, %	0.6±0.05	75000	Protein, %	0.6±0.05	75000	Protein, %
Vitamins			Vitamins			Vitamins
Thiamine (vitamin B_1), mg%	0.02	1.5	Thiamine (vitamin B_1), mg%	0.02	1.5	Thiamine (vitamin B_1), mg%
Riboflavin (vitamin B_2), mg%	0.06	1.8	Riboflavin (vitamin B_2), mg%	0.06	1.8	Riboflavin (vitamin B_2), mg%
Ascorbic acid (vitamin C), mg%	23.5	100	Ascorbic acid (vitamin C), mg%	23.5	100	Ascorbic acid (vitamin C), mg%
Phytomenadione (vitamin K), mg%	0.018	0.12	Phytomenadione (vitamin K), mg%	0.018	0.12	Phytomenadione (vitamin K), mg%

highlighted the great promise of resveratrol in treating autoimmune diseases.

We cannot but note that the published evidence of the effects of resveratrol on human health is often insufficient and some of it is controversial. For instance, the influence of resveratrol on coronary heart disease has been examined in 118 studies and only one observed a positive effect on human health (Baptista *et al.*, 2024). Administration of resveratrol was found to increase cerebral blood flow in healthy adults and patients with type I diabetes, but it did not improve cognitive function (Tran *et al.*, 2012).

Recent studies have expanded the list of biologically active substances in Amur grapes. Amur grapes have been found to contain 11 derivatives of resveratrol, named after the Amurenzin plant and denoted either by numbers from 1 to 11 or by Latin letters (Do *et al.*, 2009). Many of these derivatives are marked by anti-inflammatory, antibacterial, and antiviral activity (Shumakova and Kiselev, 2013).

There are reports of the use of Amur grape composition as an anti-allergic agent due to its suppression of the production of the pro-inflammatory cytokine TNF-α and interleukins IL-6 and IL-8 (Shin and Lee, 2008). This activity appears to come from Amurensin H, originally isolated from the vine of *V. amurensis* (Cheng *et al.*, 2005). Amurensin G, also found in Amur grapes, prevents Parkinson's disease (Park *et al.*, 2013). Korean scientists developed a composition from the stems and roots of Amur grapes to improve cognitive function and effectively treat and prevent Alzheimer's disease. The mechanism of its action is the inhibition of acetylcholinesterase (Woo *et al.*, 2005; Sohail *et al.*, 2022).

Another component of Amur grapes that is important in terms of biological value but rarely mentioned in research is vitisin A, which reduces the production of beta-amyloids (amyloid plaques) (Choi *et al.*, 2023). Accumulation of such substances accelerates aging as a result of disrupting intracellular space "cleansing" processes (Vekovtsev *et al.*, 2021). Substances similar to vitisin A are the cleansers of cells. Kushnerova (2007), a researcher from the Far East, established the lipotropic effect of the biologically active substances present in Amur grapes.

V. amurensis Rupr. is listed in the Korean Pharmacopoeia (1987) as a treatment for stroke and stimulating memory improvement. The leaves, stems, and roots of *V. amurensis* Rupr. are widely used in traditional medicine to treat pain caused by trauma, neuralgia, cancer, and abdominal diseases in China.

The antioxidant activity of the fruits of *V. amurensis* Rupr. amounts to 367.24±0.53 mg ascorbic acid equivalents/g (Chen *et al.*, 2018). The presence of polyphenols with high antioxidant activity in the composition of the Amur grape suggests the antioxidant effect of its compositions in food products containing fat fractions (including meat products) (Atrooz *et al.*, 2024). The technological effect of this function is reflected in the 20-50% extension of the shelf life of meat products compared to control samples made with classical formulations. We should also note the synergistic antioxidant effect of ascorbic acid and polyphenols. The theoretical rationale for the use of Amur grape components as antioxidants is that oxidative stress occurs due to an imbalance between the production of reactive oxygen species and the ability to neutralize them. The mismatch between excess reactive molecules and weak endogenous defenses damages cellular structures and molecules such as lipids, proteins, and DNA, which contributes to the pathogenesis of a wide range of diseases. If available in small quantities, reactive oxygen species – free radicals – act as signaling molecules that control cell activity, providing cellular protection and increasing resistance. Conversely, their excess, such as in inflammation, can trigger the production of additional free radicals. The key point is the oxidative modification of enzymes or regulatory regions, the modification of which triggers a change in cell signaling and programmed cell death. Oxidative stress and inflammation are closely related. Oxidative stress can cause inflammation, and inflammation causes oxidative stress, creating a vicious cycle that leads to cell damage and promotes a pro-inflammatory environment (see silage as an example in Niimi *et al.*, 2024). If the antioxidant defense system cannot neutralize excess free radicals, the imbalance between free radicals and the defense system can lead to pathological conditions including cancer, cardiovascular diseases, neurodegenerative disorders, atherosclerosis, etc. (Poznyak *et al.*, 2024). Antioxidants, including those derived from Amur grapes, can to some extent increase the resistance of the organism (Ali *et al.*, 2019).

Thus, current pharmacological studies have proven that *V. amurensis* Rupr. has anti-inflammatory, antimicrobial, antioxidant, anti-stress, hepatoprotective, and antitumor activity, primarily owing to resveratrol, which is studied more actively year after year and is a truly unique chemical compound with great potential in medicine and the food industry (Silva *et al.*, 2024). However, the source of resveratrol in nutrition is biologically active additives containing resveratrol extracted from grape skin and purified by various methods, rather than food products containing compositions from Amur grapes, which is more cost-effective and accessible to the population. In most studies, resveratrol is sourced from available technical grape varieties rather than Amur grapes. Therefore, the issue of food fortification with Amur grape compositions remains open.

The organoleptic characteristics of Amur grapes allow their wide application for food fortification (Tkeshelashvili and Bobozhonova, 2024). The fruits are uniform dark-blue in color with shades of violet and the taste is sour or sour-sweet, pleasant, peculiar to Amur grapes.

The main application of Amur grapes is the production of beverages, primarily fermented ones – wine and less often vinegar. However, it is virtually impossible to obtain natural

dry wine from this species due to its low sugar content in the areas of growth. Homemade wine made in the households of Khabarovsk and Primorsky Krais of Russia has a lot of added sugar and often alcohol and water. The sugar content of Amur grapes can only be increased by cultivating them in warmer latitudes, which will increase the sugar content to 23%, comparable to technical grape varieties.

Research into the application of functional food ingredients from Amur grapes for the fortification of mass-consumption food products has been conducted by Russian and world scientific schools. Studies focus on developing food technologies for confectionery products (Praskova *et al.*, 2019; Frolova and Reznichenko, 2019b; Frolova *et al.*, 2020), meat products with the addition of Amur grape seeds (Sharipova *et al.*, 2015), oxygen cocktails (Cherevach *et al.*, 2014), biologically active food additives (Emets *et al.*, 1999), and tofu (Frolova and Reznichenko, 2019a) using functional food ingredients from Amur grapes. In almost all cases, Amur grapes were added as part of biologically active additives with different names and consisting of several ingredients, some of which may have a strong technological effect on the finished food product (e.g., pectins and arabinogalactans). However, the presented studies do not shed light on the effects of the Amur grape when introduced in isolation. We found no reports of food compositions based on Amur grapes being used for the fortification of meat or dairy products, which suggests the potential scientific novelty of such technologies.

***Conclusion*:** The study found that the use of the Amur grape in the food industry in the areas of its growth is limited. In examining the consumer properties, chemical composition, biological value, and technological aspects of applying the Amur grape in the food industry, we found it to be of great value as a source of functional food ingredients. The Amur grape proves to be suitable for the fortification of mass food products from functional and technological points of view. The functional food ingredients contained in Amur grapes include iron, ascorbic acid, and polyphenols (including resveratrol and anthocyanins). These compounds replenish iron deficiency in all healthy population groups, prevent anemia and some cancer and cardiovascular diseases, combat stress, and provide antioxidant protection, which has a powerful social effect of prolonging life expectancy and improving public health. In other words, they participate in the maintenance and functioning of virtually all bodily systems. From a practical perspective, incorporating Amur grape extracts into meat products presents an opportunity to develop natural antioxidant solutions that align with consumer demand for clean-label, functional foods. However, overcoming processing challenges such as acidity, protein interactions, and flavor balance is essential for commercialization. Future research should focus on stabilization techniques, sensory evaluation, and regulatory compliance to facilitate the adoption of Amur grape-based ingredients in the food industry.

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***Policy referred*:** WHO Global Strategy on Diet, Physical Activity and Health, Codex Alimentarius (FAO/WHO) – Guidelines on Food Additives and Functional Ingredients

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REFERENCES

Abdulazeez, R., S.M. Highab, U.F. Onyawole, M.T. Jeje, H. Musa, D.M. Shehu and I.S. Ndams. 2024. Co-administration of resveratrol rescued lead-induced toxicity in Drosophila melanogaster. Environmental Toxicology and Pharmacology 109:104470. https://doi.org/10.1016/j.etap.2024.104470

Abdullayev, I., P. Gurbanov, R. Shichiyakh, P. Zhuravlev, R. Aleshko and A. Tretyak. 2024. Analysis of the impact of agriculture on the socio-economic development of municipalities. Cadernos Educacao Tecnologia e Sociedade 17:724-740. https://doi.org/10.14571/brajets.v17.n2.724-740.

Abo Nouh, F., A. Abu-Elsaoud and A. Abdel-Azeem. 2024. Induction of abiotic stress tolerance in plants by endophytic fungi hosted in wild plants. Microbial Biosystems 9:38-50. https://doi.org/10.21608/mb.2024.355966.

Al-Ghanayem, A. A., M.S. Alhussaini, A.A.I. Alyahya, M. Asad and B. Joseph. 2024. Wound healing activity of chlorogenic acid in diabetic rats is mediated through antibacterial, antioxidant, and proliferative effects. Online Journal of Biological Sciences 2024:255-262.

Ali, N., H. Afrasiab and S. Anwar. 2019. Antibacterial activity of leaf extracts of seven grape cultivars against six strains of bacteria. Advances in Life Sciences 6:159-164.

AlJudaibi, A., B. Al-Hebshi and E. Al-Judaibi. 2023. Microbiota and its relationship with inflammatory bowel diseases: An overview. Microbial Biosystems 8:1-7. https://doi.org/10.21608/mb.2023.211583.1072.

Anjum, R., M. Hamid, R. Khalil and A. Ajmal. 2023. Possible effect of ascorbic acid against zinc oxide nanoparticles induced hepatotoxicity in Swiss albino mice. International Journal of Agriculture Bioscience 12:193-198.

Atrooz, O. M., M. Al-Awaida, W. Al-Awaida, H.J. Al-Ameer and H. Uysal. 2024. Evaluating the antioxidant capacity, phenolic contents, and anticancer potential of Caralluma europaea extracts. Advances in Life Sciences 11:862-870.

Baptista, L.C., L. Wilson, S. Barnes, S.D. Anton and T.W. Buford. 2024. Effects of resveratrol on changes in trimethylamine-N-oxide and circulating cardiovascular factors following exercise training among older adults. Experimental Gerontology 194:112479. https://doi.org/10.1016/j.exger.2024.112479.

Bejenaru, L.E., A. Biţă, I. Belu, A.-E. Segneanu, A. Radu, A. Dumitru, M.V. Ciocîlteu, G.D. Mogoşanu and C. Bejenaru. 2024. Resveratrol: A review on the biological activity and applications. Applied Sciences 14:4534. https://doi.org/10.3390/app14114534.

Chen, Q., L. Diao, H. Song and X. Zhu. 2018. Vitis amurensis Rupr: A review of chemistry and pharmacology. Phytomedicine 49:111-122. https://doi.org/10.1016/j.phymed.2017.08.013.

Cheng, G., M. Lin and Q. Hou. 2005. Application of extractive of Ussurian grape on curing inflammatory disease. CN1600304. Retrieved from WIPO Patentscope.

Cherevach, E.I., M.E. Pova, L.A. Tenkovskaia, T.P. Iudina and S.A. Novak. 2014. Oxygen cocktail production method. Patent RU 2 536 894. Published December 27, 2014.

Cherniak, D.M. and M.S. Titova. 2014. Anti-stress effect of the Far Eastern plants. Pacific Medical Journal vol. 2. Retrieved from https://cyberleninka.ru/article/n/antistressornoe-deystvie-dalnevostochnyh-rasteniy.

Choi, J., S.Y. Choi, Y. Hong, Y.E. Han, S.J. Oh, B. Lee, C.W. Choi and M.S. Kim. 2023. The central administration of vitisin A, extracted from Vitis vinifera, improves cognitive function and related signaling pathways in a scopolamine-induced dementia model. Biomedicine & Pharmacotherapy 163:114812. https://doi.org/10.1016/j.biopha.2023.114812.

Demolin-Leite, G.L. 2024. Percentage of importance index-production unknown: Loss and solution sources identification on the system. Brazilian Journal of Biology 84:e253218. https://doi.org/10.1590/1519-6984.253218.

Do, T.H., H. Kim, P.T. Thuong, T.M. Ngoc, I. Lee, N.D. Hung and K. Bae. 2009. Antioxidant and lipoxygenase inhibitory activity of oligostilbenes from the leaf and stem of Vitis amurensis. Journal of Ethnopharmacology 125:304-309. https://doi.org/10.1016/j.jep.2009.06.019.

Emets, Iu.A., V.G. Mazurik, O.N. Kolei, G.E. Savostianova and I.P. Morozova. 1999. Biologically active food supplement Russkii Ostrov. Patent RU 2 130 738. Published May 27, 1999.

Frolova, N.A. and Iu.I. Reznichenko. 2019a. Investigation of the chemical composition of fruit and berry raw materials of the Far Eastern region as a promising source of nutrients and bioactive compounds. Problems of Nutrition 88:83-90.

Frolova, N.A. and I.I. Reznichenko. 2019b. Composition of ingredients for making a fortified confectionery product of the type of tirage toffee. Patent RU 2 687 459. Published May 13, 2019.

Frolova, N.A., Iu.A. Praskova, V.A. Pomozova, T.F. Kiseleva, Iu.I. Reznichenko, N.V. Shkrabtak and D.B. Pekov. 2020. Functional marmalade production method. Patent RU 2 717 497. Published March 23, 2020.

Gezer, A., H. Ustundag, A.S. Mendil, G. Bedir and L. Duysak. 2024. Hepatoprotective effects of resveratrol on α-amanitin-induced liver toxicity in rats. Toxicon

247:107855. https://doi.org/10.1016/j.toxicon.2024.107855.

Idamokoro, E.M. and A.S. Niba. 2024. Bibliometric analysis of global research trends on invertebrate and conservation studies from 1990-2022. Online Journal of Biological Sciences 2025:73-90.

Jetha, K., A. Vyas, A. Tripathi, J. Gandhi and V. Chavda. 2024. Unveiling resveratrol's potential: Navigating the landscape of autoimmune diseases. Clinical Traditional Medicine and Pharmacology 5:200145. https://doi.org/10.1016/j.ctmp.2024.200145.

Kozhanov, Z., A. Serikbayeva, N. Kozhanova, D. Sydykov, K. Sadvakassov and M. Mukhametkaliev. 2023. Impact of functional foods on improving the health of the Kazakh population. Advances in Life Sciences 10:555-562.

Kushnerova, T.V. 2007. Application of Vitis amurensis grape extract in experimental hypercholesterolemia. Bulletin of Physiology and Pathology of Respiration 25. Retrieved from https://cyberleninka.ru/article/n/primenenie-ekstrakta-iz-vinograda-vitis-amurensis-pri-eksperimentalnoy-giperholesterinemii.

Lima, Â.C.O., E. R. Dias, I.M.A. Reis, K.O. Carneiro, A.M. Pinheiro, A.S. Nascimento, S.M.P.C. Silva, C.A.L. Carvalho, A.V.R. Mendonça, I.J.C. Vieira, R. Braz Filho and A. Branco. 2024. Ferulic acid as major antioxidant phenolic compound of Tetragonisca angustula honey collected in Vera Cruz - Itaparica Island, Bahia, Brazil. Brazilian Journal of Biology 84:e253599. https://doi.org/10.1590/1519-6984.253599.

Minkhaidarov, V. Iu. and N.G. Rozlomii. 2021. Resource assessment of medicinal plants in mountain cedar and broad-leaved deciduous forests growing in the south of Far East. Forestry Bulletin vol. 3. Retrieved from https://cyberleninka.ru/article/n/resursnaya-otsenka-lekarstvennyh-rasteniy-gornyh-kedrovo-shirokolistvennyh-lesov-proizrastayuschih-v-usloviyah-yuga-dalnego-vostoka.

MR 2.3.1.0253-21. 2021. Norms of physiological requirements in energy and nutrients for various groups of the population of the Russian Federation.

Ndimbo, G.K. and E.Haulle. 2024. Large-scale agricultural investments and contract farming in Tanzania: A systematic review on the livelihoods, food security and ecological implications. Journal of Agriculture and Food Research 18:101514. https://doi.org/10.1016/j.jafr.2024.101514

Negrul, A.M. 1952. Viticulture with the basics of ampelography and selection. Moscow:427.

Niimi, M., M. Kurata, G. Ishigaki and Y. Ishii. 2025. Fermentation quality and aerobic stability of silages from forage crops mixed with bamboo silage in Southern Kyushu, Japan. Online Journal of Biological Sciences 1:125-133.

Oohayyid, M.A. and Z.S. Musihb. 2024. Influence of nurses' workload regarding medication errors knowledge in pediatric critical care unit. Pakistan Journal of Life and Social Sciences 22:1450-1459.

Park, J.S., H.W. Ryu and W.K. Oh. 2013. Pharmaceutical composition for preventing and treating Parkinson's disease which includes amurensin G extracted from Vitis amurensis as an active ingredient. KR1020130139025. Retrieved from WIPO Patentscope.

Poznyak, A.V., M.B. Ekta, V.N. Sukhorukov, M.A. Popov and A.V. Grechko. 2024. The benefits of selected nutritional compounds towards atherosclerosis management. Online Journal of Biological Sciences 1:48-63.

Praskova, Iu.A., T.F. Kiseleva, I. Iu. Reznichenko, N.A. Frolova, N.V. Shkrabtak and Iu. Lourens. 2021. Biologically active substances of Vitis Amurensis Rupr.: Preventing premature aging. Food Processing: Techniques and Technology vol. 1. Retrieved from https://cyberleninka.ru/article/n/biologicheski-aktivnye-veschestva-vitis-amurensis-rupr-dlya-profilaktiki-prezhdevremennogo-stareniya.

Praskova, Iu.A., V.A. Pomozova, T.F. Kiseleva, Iu.I. Reznichenko, N.V. Shkrabtak and N.A. Frolova. 2019. Composition for preparation of functional grade jam. Patent RU 2 690 650. Published June 4, 2019.

Qin, H., X. Cui, X. Shu and J. Zhang. 2023. The transcription factor VaNAC72-regulated expression of the VaCP17 gene from Chinese wild Vitis amurensis enhances cold tolerance in transgenic grape (V. vinifera). Plant Physiology and Biochemistry 200:107768.

Shafiq, N., A. Jannat, M. Rashid, S. Parveen and N. Noor. 2024. A comprehensive review on history, sources, biosynthesis, chemical synthesis and applications of stilbenes. Mini-Reviews in Organic Chemistry. Advance online publication. https://doi.org/10.2174/011875629830793024053107240.

Shagapov, R.Sh., R.R. Shagapov and T.R. Shagapov. 2012. Amur grape (Vitis amurensis Rupr.) under the conditions of Priuralye. Izvestia Orenburg State Agrarian University vol. 36. Retrieved from https://cyberleninka.ru/article/n/amurskiy-vinograd-vitis-amurensis-rupr-v-usloviyah-priuralya.

Sharipova, T.V., N.M. Mandro, E.I. Reshetnik, V.A. Maksimiuk and E.Iu. Vodolagina. 2015. Method of production of meat and vegetable minced semi-finished products for gerodietic nutrition. Patent RU 2 544 614. Published March 20, 2015.

Shin, T.Y. and T.K. Lee. 2008. Method for preparing an allergy-treating composition from an extract of Vitis amurensis capable of decreasing generation of TNF-α, IL-6, and IL-8 in human cells without side effects of

long-term medication. KR100846100. Retrieved from WIPO Patentscope.

Shumakova, O.A. and K.V. Kiselev. 2013. Influence of the gene PgCDPK2ds1 expression on resveratrol production in cellular cultures of the Amur grapes (Vitis amurensis Meyer). Bulletin of KrasGAU vol. 1. Retrieved from https://cyberleninka.ru/article/n/vliyanie-ekspressii-gena-pgcdpk2ds1-na-produktsiyu-rezveratrola-v-kletochnyh-kulturah-vinograda-amurskogo-vitis-amurensis-meyer.

Silva, B.J.P., R.O.S. Souza, K.K.L. Yamaguchi, F.M.A. Silva, H.H.F. Koolen, V.F. Veiga Junior and E.S. Lima. 2024. Hepatoprotective and antioxidant activities of phenolic-rich extract from shell of nut Brazil (Bertholletia excelsa H.B.K.). Brazilian Journal of Biology 84:e288958. https://doi.org/10.1590/1519-6984.288958.

Sohail, B., A.W. Nafe and R. Malik. 2022. Recent advances in the function of vitamins in the preventative measures and cure of Alzheimer's disease: A literature review. Advances in Life Sciences 9:239-269.

Souid, I., A. Korchef and S. Souid. 2022. In silico evaluation of Vitis amurensis Rupr. polyphenol compounds for their inhibition potency against COVID-19 main enzymes Mpro and RdRp. Saudi Pharmaceutical Journal 30:570-584. https://doi.org/10.1016/j.jsps.2022.02.014.

Tkeshelashvili, M. and G. Bobozhonova. 2024. Enhancing gerodietic nutrition: Innovative technology for developing health-promoting feed. Advances in Life Sciences 11:112-118.

Tran, T.H., W.K. Oh, B.T. Quyen, T.T. Dao, J.H. Yoon, S.Y. Yun and K.W. Kang. 2012. Potent vasodilation effect of amurensin G is mediated through the phosphorylation of endothelial nitric oxide synthase. Biochemical Pharmacology 84:1437-1450. https://doi.org/10.1016/j.bcp.2012.09.004.

Türk, Z., F. Leiber, T. Schlittenlacher, M. Hamburger and M. Walkenhorst. 2025. Multiple benefits of herbs: Polygonaceae species in veterinary pharmacology and livestock nutrition. Veterinary and Animal Science 27:100416. https://doi.org/10.1016/j.vas.2024.100416

Vekovtsev, A.L., E.M. Serba, B. Biambaa and V.M. Pozniakovskii. 2021. Microbiome and biohacking: Health management paradigm. Food Industry 6:16-22. https://doi.org/10.29141/2500-1922-2021-6-2-2.

Wang, J.N., Y. Hano, T. Nomura and Y.J. Chen. 2000. Procyanidins from the seeds of Vitis amurensis. Phytochemistry 53:1097-1102. https://doi.org/10.1016/S0031-9422(00)00004-2.

Woo, S.S., D.S. Kim, J.H. Ryu, J.S. Song, M.S. Oh, K.W. Lee and S.Y. Sung. 2005. Composition comprising extract of Vitis genus plant showing excellent acetylcholinesterase inhibitory activity for improving cognitive function and effectively treating and preventing Alzheimer's disease. KR1020050053038. Retrieved from WIPO Patentscope.

Zhao, W., Y. Zhu, S.K. Wong, N. Muhammad, K.L. Pang and K.Y. Chin. 2024. Effects of resveratrol on biochemical and structural outcomes in osteoarthritis: A systematic review and meta-analysis of preclinical studies. Heliyon 10:e34064. https://doi.org/10.1016/j.heliyon.2024.e34064.